UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/577,347	05/24/2000	Maria Ronay	YOR9-2000-0109	5095

47939 7590 01/25/2005

CONNOLLY BOVE LODGE & HUTZ LLP (IBM YORKTOWN)
1990 M STREET, NW
SUITE 800
WASHINGTON, DC 20036-3425

EXAMINER	
SONG, MATTHEW J	
ART UNIT	**PAPER NUMBER**
1765	

DATE MAILED: 01/25/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

UNITED STATES PATENT AND TRADEMARK OFFICE

COMMISSIONER FOR PATENTS
UNITED STATES PATENT AND TRADEMARK OFFICE
P.O. Box 1450
ALEXANDRIA, VA 22313-1450
www.uspto.gov

MAILED

JAN 25 2005

GROUP 1700

BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 09/577,347
Filing Date: May 24, 2000
Appellant(s): RONAY, MARIA

Burton Amernick
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 11/15/2004.

(1) ***Real Party in Interest***

A statement identifying the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

A statement identifying the related appeals and interferences, which will directly affect or be directly affected by or have a bearing on the decision in the pending appeal is contained in the brief.

(3) Status of Claims

The statement of the status of the claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Invention

The summary of invention contained in the brief is correct.

(6) Issues

The appellant's statement of the issues in the brief is correct.

(7) Grouping of Claims

The rejection of claims 13-36 stand or fall together because appellant's brief does not include a statement that this grouping of claims does not stand or fall together and reasons in support thereof. See 37 CFR 1.192(c)(7).

(8) Claims Appealed

The copy of the appealed claims contained in the Appendix to the brief is correct.

(9) Prior Art of Record

5,876,490	Ronay	3-1999

5,801,082	Tseng	9-1998
5,814,236	Booth	9-1998

(10) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claims 13-36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Admission in view of Ronay (US 5,876,490).

Appellant's admitted prior art teaches in many microelectronics applications a Si_3N_4 layer is deposited under a SiO_2 layer to serve as a polish stop, particularly in Shallow Trench Isolation (STI) structures. Admission also teaches a layer of silicon dioxide, silicon nitride and/or silicon oxynitride insulator is located beneath a metal layers such as copper, tungsten or aluminum layer and a liner such as Ti, TiN, Ta and TaN to act as a polish stop and the liner can be removed. Admission also teaches using slurries such as silica slurry or ceria slurry (pg 2-3 of the instant specification)

Admission does not teach a slurry comprising abrasive particles and an anionic polyelectrolyte in an amount sufficient to increase the polish rate ratio of the silicon dioxide to the silicon nitride and contact with the surface of a polishing pad.

In a method of polishing, note entire reference, Ronay teaches a slurry comprises abrasive particles and a polyelectrolyte, where the polyelectrolyte is cationic when the abrasive particles are anionic and the polyelectrolyte is anionic when the abrasive particles are cationic (col 4, ln 55-65). Ronay also teaches polyacrylic acid, polymethacrylic acid, polymethylmethacrylic acid, polymaleic acid, polyvinylsulfonic acid, polyvinylamine,

polyethylenimine and poly (4-vinylpryridine) (col 5, ln 25-40 and Table 1). Ronay also teaches the molecular weight of the polyelectrolyte is between about 500-10000 (col 6, ln 25-35). Ronay also teaches ceria, alumina, silica and zirconia abrasive particles at 1wt% (Example 2 and claim 14). Ronay also teaches 0.2 wt% polyacrylic acid (Example 2) and the slurry is an aqueous slurry (claim 15). Ronay also teaches planarization of aluminum, tungsten and copper (col 6, ln 50 to col 7, ln 10). Ronay also teaches a polishing pad (col 2, ln 30-40). Ronay also teaches the slurry results in reduced polishing rate at recesses while the abrasive particles maintain high polish rates at elevations, which leads to improved planarization in shallow trench isolation applications (Abstract and col 1, ln 25-67).

It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Admission with Ronay's slurry to improve planarization, as taught by Ronay.

The combination of Admission and Ronay is silent to the amount of polyelectrolyte is sufficient to increase the polishing rate ratio of the silicon dioxide to the silicon nitride. However, the combination of Admission and Ronay teach a similar amount of abrasive particles, 1 wt%, and polyelectrolyte, 0.2 wt%, as appellant, note instant claims 24 and 26 and Example 2; therefore the amount of abrasive particles and polyelectrolyte is inherently sufficient to increase the polishing rate ratio of the silicon dioxide to the silicon nitride. Furthermore, the combination of Admission and Ronay teach the amount of polyelectrolyte and abrasive particles is selected to achieve planarization ('490 col 5, ln 14-25), which is a teaching that the amount of polyelectrolyte and abrasive particles is a result effective variable. Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the

combination of Admission and Ronay to obtain same by conducting routine experimentation of a result effective variable (MPEP 2144.05).

Claims 13-17, 22-27, 30-36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tseng (US 5,801,082) in view of Ronay (US 5,876,490).

Tseng teaches a method of making a shallow trench isolation (STI) comprising a Si_3N_4 layer **14** and a silicon oxide layer **22**, SiO_2, deposited to fill trenches **4** and is chemical/mechanically polished back to the surface of the Si_3N_4 layer **14**. Tseng also teaches the layer **22** is deposited to a thickness sufficient to fill the trenches and to a height tat extends above the surface of the Si_3N_4 layer (col 4, ln 1 to col 5, ln 25).

Tseng does not teach a slurry comprising abrasive particles and an anionic polyelectrolyte in an amount sufficient to increase the polish rate ratio of the silicon dioxide to the silicon nitride and contact with the surface of a polishing pad.

In a method of polishing, note entire reference, Ronay teaches a slurry comprises abrasive particles and a polyelectrolyte, where the polyelectrolyte is cationic when the abrasive particles are anionic and the polyelectrolyte is anionic when the abrasive particles are cationic (col 4, ln 55-65). Ronay also teaches polyacrylic acid, polymethacrylic acid, polymethylmethacrylic acid, polymaleic acid, polyvinylsulfonic acid, polyvinylamine, polyethylenimine and poly (4-vinylpryridine) (col 5, ln 25-40 and Table 1). Ronay also teaches the molecular weight of the polyelectrolyte is between about 500-10000 (col 6, ln 25-35). Ronay also teaches ceria, alumina, silica and zirconia abrasive particles at 1wt% (Example 2 and claim 14). Ronay also teaches 0.2 wt% polyacrylic acid (Example 2) and the slurry is an aqueous slurry

(claim 15). Ronay also teaches a polishing pad (col 2, ln 30-40). Ronay also teaches the slurry results in reduced polishing rate at recesses while the abrasive particles maintain high polish rates at elevations, which leads to improved planarization in shallow trench isolation applications (Abstract and col 1, ln 25-67).

It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Tseng with Ronay's slurry to improve planarization, as taught by Ronay.

The combination of Tseng and Ronay teach raised region of SiO_2 **22** and lower regions of Si_3N_4 **22** and the ratio of abrasive particles and polyelectrolyte is selected to result in reduced polishing rate at recesses and high polish rate at elevation, this reads on appellant increase the polishing rate ratio of the silicon dioxide to the silicon nitride. Furthermore, the combination of Admission and Ronay teach a similar amount of abrasive particles, 1 wt%, and polyelectrolyte, 0.2 wt%, as appellant, note instant claims 24 and 26 and Example 2; therefore the amount of abrasive particles and polyelectrolyte is inherently sufficient to increase the polishing rate ratio of the silicon dioxide to the silicon nitride

Claims 18-21 and 28-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Booth (US 5,814,236) in view of Ronay (US 5,876,490).

Booth teaches a silicon dioxide layer **28**, this reads on appellant's member, and aluminum plugs **36**, this reads on appellant's metal surface, are subjected to a chemical mechanical planarization technique with a slurry and polishing pad, where the aluminum plugs are elevated above the surface of the silicon dioxide layer (col 4, ln 5-45 and Fig 5).

Booth does not teach a slurry comprising abrasive particles and an cationic polyelectrolyte in an amount sufficient to increase the polish rate ratio of the metal to the member.

In a method of polishing, note entire reference, Ronay teaches a slurry comprises abrasive particles and a polyelectrolyte, where the polyelectrolyte is cationic when the abrasive particles are anionic and the polyelectrolyte is anionic when the abrasive particles are cationic (col 4, ln 55-65). Ronay also teaches polyacrylic acid, polymethacrylic acid, polymethylmethacrylic acid, polymaleic acid, polyvinylsulfonic acid, polyvinylamine, polyethylenimine and poly (4-vinylpryridine) (col 5, ln 25-40 and Table 1). Ronay also teaches the molecular weight of the polyelectrolyte is between about 500-10000 (col 6, ln 25-35). Ronay also teaches ceria, alumina, silica and zirconia abrasive particles at 1wt% (Example 2 and claim 14). Ronay also teaches 0.2 wt% polyacrylic acid (Example 2) and the slurry is an aqueous slurry (claim 15). Ronay also teaches planarization of aluminum, tungsten and copper (col 6, ln 50 to col 7, ln 10). Ronay also teaches a polishing pad (col 2, ln 30-40). Ronay also teaches the slurry results in reduced polishing rate at recesses while the abrasive particles maintain high polish rates at elevations, which leads to improved planarization in shallow trench isolation applications (Abstract and col 1, ln 25-67).

It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Booth with Ronay's slurry to improve planarization, as taught by Ronay.

The combination of Booth and Ronay teach raised region of aluminum **36** and lower regions of Silicon dioxide **28** and the ratio of abrasive particles and polyelectrolyte is selected to result in reduced polishing rate at recesses and high polish rate at elevation, this reads on

appellant increase the polishing rate ratio of the metal to the member. Furthermore, the combination of Booth and Ronay teach a similar amount of abrasive particles, 1 wt%, and polyelectrolyte, 0.2 wt%, as appellant, note instant claims 24 and 26 and Example 2; therefore the amount of abrasive particles and polyelectrolyte is inherently sufficient to increase the polishing rate ratio of the silicon dioxide to the silicon nitride

(11) Response to Argument

Ronay teaches a slurry composition useful for polishing and planarizing surfaces in the microelectronics industry (col 1, ln 10-21) comprising abrasive particles and either an anionic or cationic polyelectrolyte (col 4, ln 55-65). Appellants' admitted prior art, Tseng and Booth are provided to teach conventional microelectronic structures, such as a silicon dioxide in contact with a silicon nitride and a metal surface in contact with a oxide, which are planarized. The primary issue between the prior art of record and the claimed invention is the prior art does not teach using an anionic polyelectrolyte in an amount sufficient to increase the polishing ratio of a silicon oxide to silicon nitride or using a cationic polyelectrolyte in an amount sufficient to increase the polishing ratio of a metal to an oxide, nitride or oxynitride. The Examiner's position is the claimed increased polishing ratios would have naturally flowed from the teachings of the prior art because Ronay teaches using a similar polishing slurry comprising cationic or anionic polyelectrolytes and similar abrasive particles at similar concentrations as Appellants; therefore using the slurry taught by Ronay on the conventional structures taught by Admission, Tseng or Booth would have produce the claimed effect of an increased polishing ratio. And the fact that appellant has recognized another advantage which would flow naturally from following the

suggestion of the prior art cannot be the basis for patentability when the differences would otherwise be obvious. See *Ex parte Obiaya*, 227 USPQ 58, 60 (Bd. Pat. App. & Inter. 1985).

The slurry claimed by Appellants and the slurry taught by Ronay is exactly the same in terms of abrasive particles, polyelectrolyte and concentrations. Appellants claims using an about 0.05-5 percent by weight of an anionic polyelectrolyte to increase the polishing ratio of silicon dioxide to silicon nitride and about 0.05-5 percent by weight of a cationic polyelectrolyte to increase the polishing ratio of metal to silicon dioxide, silicon nitride or silicon oxynitride, note claims 13, 18, 26 and 33. Ronay teaches the concentration of polyelectrolyte is about 5-50% by weight of the abrasive particles (claim 23) and slurry comprising 1 weight percent of an abrasive particle (col 9, ln 15-25), which about 0.05-5 weight percent of polyelectrolyte. Ronay also teaches using such as poly(acrylic acid), poly(methacrylic acid), poly(methyl methacrylic acid) (polymaleic acid), poly(vinylsulfonic acid) and polyethylenimine (col 5, ln 25-50 and Table 1), which are exactly the same polyelectrolytes claimed by Appellants, note claims 15 and 20. Appellants teach using abrasive particles of ceria, alumina, silica or zirconia, note claim 23, and Ronay also teaches using ceria, alumina, silica or zirconia (col 7, ln 40-45). Ronay also generally teaches using the slurry for polishing and planarizing surfaces in the microelectronics industry (col 1 ,ln 10-20) and specifically for polishing oxides and metals (col 6, ln 32-65). Therefore, using the slurry taught by Ronay on the conventional structures taught by Admission, Tseng or Booth would necessarily result in the claimed increase in polishing ratio because the slurry taught by the prior art is the same as the slurry used by Appellants to achieve the claimed increase in polishing ratio. Although, Ronay does not specifically teach using an anionic polyelectrolyte for oxide and a cationic polyelectrolyte for metals, Ronay does teach using either

an anionic or a cationic polyelectrolyte; therefore it would have been obvious to a person of ordinary skill in the art at the time of the invention to use a cationic polyelectrolyte for metal polishing or an anionic polyelectrolyte for oxide polishing because Ronay teaches both and there are only two type of polyelectrolytes to chose from, anionic or cationic.

Appellants' allege that Ronay does not disclose the use of the slurry composition containing a cationic polyelectrolyte to enhance the polishing ratio of metal to silicon dioxide, silicon nitride or silicon oxynitride or using a slurry composition containing an anionic polyelectrolyte to enhance the polishing ratio of silicon dioxide to silicon nitride (pg 7). The Examiner has admitted this in the rejection. However, the Examiner maintains that the advantages claimed would have naturally flowed from using Ronay's slurry, which is similar to the instantly claimed slurry, for oxide or metal polish on the conventional microelectronic structures taught by Admission, Tseng or Booth. The claims are not patentable because the fact that appellant has recognized another advantage which would flow naturally from following the suggestion of the prior art cannot be the basis for patentability when the differences would otherwise be obvious. See *Ex parte Obiaya*, 227 USPQ 58, 60 (Bd. Pat. App. & Inter. 1985).

In response to appellant's argument that the references fail to show certain features of appellant's invention, it is noted that the features upon which appellant relies (i.e., employing excess polyelectrolyte (final paragraph of page 7 continued on page 8, pg 9 and the final paragraph of page 10 continued on page 11) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993). There is no support for excess polyelectrolyte explicitly or implicitly. Appellants' allege that

support for this feature is implicit because the claims recite the polyelectrolyte is present in an amount sufficient to increase the recited polishing ratio. The argument is directed to an excess of polyelectrolyte to increase polishing ratio, not an excess of polyelectrolyte to coat the abrasive particles. Although, Ronay teaches the concentration of abrasive particles exceeds the concentration of polyelectrolyte, there is no support for Appellants argument that Ronay does not teach an excess since the claimed amount of polyelectrolyte by Appellant is the same taught by Ronay, as discussed previously above.

Appellants' argument that adding poly(acrylic acid) to a silica slurry would not improve the planarization, but will achieve selective polishing of silicon dioxide as compared to silicon nitride is noted (page 8, 9 and 11). Appellants' claims are not limited to the example taught and the claimed method is much broader and incorporates a variety of abrasive particles. Although, there are particular combinations of abrasive particles and polyelectrolytes, which Appellants can use to achieve a desired polishing ratio, which would not be obvious to Ronay, none of these combinations are currently claimed. Also, many other combinations which meets the claimed limitations would be obvious to Ronay, such as using a zirconia or ceria abrasive particle with an anionic polyelectrolyte to polish a silicon dioxide, note column 6, lines 49-60.

In response to Appellants' argument that there is no suggestion to combine the references (pg 13), the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988)and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir.

1992). In this case, it would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the oxide polish taught by Tseng or Admission or the metal polish taught by Booth or Admission by using the polishing slurry containing anionic or cationic polyelectrolytes taught by Ronay for oxide or metal polishing because Ronay polishing slurry results in improved planarization (col 1, ln 10-21 and col 6, ln 32-65).

In response to Appellants' argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning (pg 13), it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the appellant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971). The motivation to use Ronay's polishing slurry is directly obtained from Ronay's teachings, not from Appellants' invention.

Appellants' argument that no result or property can be ignored in determining patentability and comparing the claimed invention to the cited art is noted (pg 13). All the features of the instantly claimed invention have been address by the Examiner. The claimed increased polishing ratio, which is not explicitly taught by the prior art, is inherent for the reasons explained in the Rejection.

In conclusion, Ronay teaches the a slurry comprising abrasive particles and a polyelectrolyte, either cationic or anionic depending on the abrasive particle used. The slurry is identical to the slurry taught by Appellants in terms of abrasive particles used, polyelectrolytes used and the concentration of both. The primary difference is that Appellants have discovered

that using the cationic slurry to polish metal and silicon dioxide, silicon nitride or silicon oxynitride results in an increased polishing ratio for the metal and using an anionic slurry to polish silicon dioxide and silicon nitride results in an increased polishing ratio for oxide. The Examiner maintains that the increased polishing ratios would have naturally flowed from Ronay's suggestion of using the polishing slurry to improve planarization of metal and oxide surfaces. And although Ronay does not specifically teach using a cationic polyelectrolyte for metal polishing or a anionic polyelectrolyte to polish oxide, it would have been obvious to a person of ordinary skill in the art at the time of the invention to using a cationic polyelectrolyte for metal polishing or a anionic polyelectrolyte to polish oxide because Ronay only teaches two possibilities, using a cationic or an anionic polyelectrolyte and the selection of the type of polyelectrolyte is dependent on the abrasive particle used.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

Matthew J Song
Examiner
Art Unit 1765

Matthew Song
January 21, 2005

Conferees
Nadine Norton

NN

Glenn Caldarola

Burton A. Amernick
Pollock Vande Sande & Amernick RLLP
1990 M Street, N.W.
Suite 800
Washington, DC 20036-3425

NADINE G. NORTON
SUPERVISORY PATENT EXAMINER